TILT MECHANISM

TECHNICAL FIELD

The present invention relates to tilt mechanisms, and in particular, though not solely, to tilt mechanisms suitable as an outboard motor tilt mechanism and/or component of same.

BACKGROUND ART

At present there are a number of outboard motor/engine tilt systems available, which include electrical and hydraulic trimming systems (mainly for use with motors of a size over 30 horsepower (HP) due to weight considerations). Such systems often require installation by skilled technicians, and can be relatively difficult and/or expensive to install and maintain.

The use of the term 'tilt' is considered to substantially refer to the provision for movement (usually including at least a component of rotational movement) of an object or boat outboard motor from a first angled position (with respect to a boat for example) to a second angled position (and/or any other position), and such movement may also be reversible. First and second positions are not fixed locations, but merely used to illustrate a change in location position and/or angle of an object relative to a support. Usually a first position is with the motor's propeller submerged and a second position is with the propeller clear of the water.

Tilting systems for lighter-weight motors/engines (generally those under 30 HP) are often not installed given the relatively greater costs compared to the cost of the motor itself and/or the general usage considerations of those vessels utilising smaller motors. Motors without auto-trim systems and/or tilt mechanisms require a relatively large physical effort to tilt out of the water and to operate various motor position locking levers. This means that the operator needs to stand adjacent to the motor/engine and physically tilt the motor. Further, the hinged bracket pivot points on these motors are

such that the they are not balanced for easy lifting, which can be a problem when a boat approaches shallow water, with the motor operator having to manoeuvre the boat and also co-ordinate tilting/raising the engine at the roughly the same time. This may result in complex operator manoeuvres or difficult operator operating positions.

Generally, motors under 30 HP do not have trim or tilt mechanisms supplied that substantially reduce physical effort, and if they do, such mechanisms may require battery (or powered, mechanical or hydraulic) assistance to operate and/or are slow to operate (which may not be particularly useful during an emergency).

It is therefore an object of the present invention to provide a tilting mechanism or device to go at least some way towards addressing the foregoing problems or at least to provide the public and/or industry with a useful choice.

It is preferable for a system or mechanism to be designed that allows for quick and easy tilt of motors. A mechanism that allows the motor to tilt, without substantial physical manual effort, and to additionally clear the bottom in shallow water (i.e. not contacting the seabed or lakebed by running aground) when beaching the boat, or entering shallower waterways. It may also be advantageous to provide a system that reduces the amount of physical handling of a motor into a tilted position suitable to avoid contact with a seabed or lakebed and which can be roughly deemed to be a hands-free tilt system for boat outboard motors. A tilt mechanism which does not require sophisticated couplings and which does not require hydraulic or electrical input would be an advantage.

All references, including any patents or patent applications cited in this specification are hereby incorporated by reference. No admission is made that any reference constitutes prior art. The discussion of the references states what their authors assert, and the applicants reserve the right to challenge the accuracy and pertinency of the cited documents. It will be clearly understood that, although a number of prior art publications are referred to herein, this reference does not constitute an admission that

any of these documents form part of the common general knowledge in the art, in New Zealand or in any other country.

It is acknowledged that the term 'comprise' may, under varying jurisdictions, be attributed with either an exclusive or an inclusive meaning. For the purpose of this specification, and unless otherwise noted, the term 'comprise' shall have an inclusive meaning - i.e. that it will be taken to mean an inclusion of not only the listed components it directly references, but also other non-specified components or elements. This rationale will also be used when the term 'comprised' or 'comprising' is used in relation to one or more steps in a method or process.

Further aspects and advantages of the present invention will become apparent from the ensuing description which is given by way of example only.

DISCLOSURE OF INVENTION

Accordingly, in a first aspect, the invention consists in a tilt device comprising:

at least one side mounting bracket supporting a backing plate the backing plate having a lower operational position and a raised storage position, and

an adjustable connection arrangement connecting the backing plate to the at least one side mounting bracket,

wherein the adjustable connection arrangement includes first and second adjustable connection points which are restrained to each travel in arcuate paths during movement of said backing plate between said operational and storage positions, and wherein when in said operational position, the force due to gravity on the backing plate produces biasing forces about said respective adjustable connection points in opposite directions along said arcuate paths.

Preferably, two side mounting brackets and two adjustable connection arrangements are joined by the backing plate.

Preferably, said adjustable connection arrangement comprises pivoting link arms.

Preferably, said adjustable connection arrangement comprises first and second curved slots, each of which constrains the movement of a respective adjustable connection point.

Preferably, said first and second curved slots are housed within said side mounting bracket.

Preferably, said first and second curved slots are housed within said backing plate.

Preferably, a biasing means is also provided, attached to said backing plate which augments said biasing forces upon said adjustable connection points.

Preferably, said biasing means is a spring or piston.

Preferably, the biasing force provided by said biasing means is adjustable.

Preferably, a stopper prevents said backing plate from moving to positions beyond said lower operational position.

Preferably, a locking means is employed to substantially stabilise said backing plate against rotation.

Preferably, said adjustable connection arrangement comprises a first pivoting link arm and a second pivoting link arm.

Preferably, said first pivoting link arm has an upper first end pivotally connected to an upper region of said at least one side mounting bracket, and a lower second end pivotally connected to an upper region of said backing plate, and wherein said second pivoting link arm has an upper first end pivotally connected to an upper region of said at least one side mounting bracket, and a lower second end pivotally connected to a lower region of said backing plate.

Preferably, said first pivoting link arm and said second pivoting link arm are substantially different lengths.

In a second aspect, the invention consists in an outboard motor including a tilt device according to the first aspect.

In a still further aspect, the invention consists in a boat including a tilt device according to the first aspect or an outboard motor according to the second aspect.

BRIEF DESCRIPTION OF DRAWINGS

Further aspects of the present invention will become apparent from the following description which is given by way of example only and with reference to the accompanying drawings in which:

Figure 1: illustrates a partial cross-sectional side view of one possible embodiment of a tilt device according to the present invention;

Figure 2: illustrates the arcuate pathways the connection points travel in the embodiment of Figure 1;

Figure 3: illustrates a partial non-sectional side view of an alternative to the embodiment of the tilt device of Figure 1;

Figure 4: illustrates a partial cross-sectional side elevational view of an alternative embodiment of the tilt device shown in Figure 3 in which a biasing means is shown in a retracted state;

Figure 5: illustrates the tilt device of Figure 4, wherein the biasing means is shown in an extended state;

Figure 6: illustrates an alternative embodiment to the tilt device of Figure 4;

Figure 7: illustrates the tilt device of Figure 6 with the biasing means in an extended state.

Figure 8a: illustrates a perspective view of the tilt device of Figure 1 attached to a boat in a first attachment configuration; and

Figure 8b: illustrates a perspective view of the tilt device of Figure 1 in an alternative attachment configuration.

BEST MODES FOR CARRYING OUT THE INVENTION

With reference to the drawings and in particular Figure 1, a tilting mechanism or device 1 may be provided by a side mounting bracket 2, supporting a backing plate 3 having a mounting board 3a. The backing plate 3 has a lower operational position, defined as position 4 and a raised storage position defined as position 5. The tilting device may also utilise two side mounting brackets and two adjustable connection arrangements, joined by a backing plate.

An adjustable connection arrangement 11, 12, 6a, 6b, 20 connects the backing plate 3 to the side mounting bracket 2. At least one side mounting bracket may be provided, with further brackets employed as necessary to support the backing plate.

The side mounting bracket may be a plate type configuration as shown in figures 1 to 8. In an alternative embodiment the side mounting brackets maybe in the form of arms (not shown) extending from attachment points which for example may be of a transom region of a boat, and extended to reach the backing plate and adjustable connection arrangements 6.

The adjustable connection arrangement includes 6a and second 6b adjustable connection points. Adjustable connection points 6a and 6b are restrained to each travel in arcuate pathways, as illustrated in figure 2 by pathways 7 and 8.

The adjustable connection arrangement may comprise first and second curved slots 20 (or a slotted roller type arrangement), each of which constrains the movement of a respective adjustable connection point 6a, 6b. The curved slots may be housed within the side mounting bracket 2 or within the backing plate 3, and within which the

adjustable connection moves. The backing plate may also have a mounting board 3b, to which an object may be attached. Such a mounting board may extend between or from a backing plate 3.

The arcuate pathways 7, 8 may have constant or varying radii and may be re-arranged and adjusted to provide a biasing force about the adjustable connection points in opposite directions, as indicated by arrows 9 and 10 by combining force components resulting from gravitational force upon the backing plate.

The first and second adjustable connection points 6a and 6b respectively are preferably pivotally connected between the backing plate 3 and the side mounting bracket 2 by first and second pivoting link arms 11 and 12, as shown in figures 1 and 2. Alternatively as already mentioned the adjustable connection points 6a and 6b may be rods or rollers constrained within curved slots20 as shown in figures 3 to 7. For example, roller bearings may be utilised or alternatively low friction slidable plastic rods or pins, preferably to reduce the frictional force components between the adjustable connection arrangement and the backing plate in such an arrangement.

Preferably, the adjustable connection arrangement 11, 12, 6a, 6b, 20 allows the backing plate 3 the ability to tilt or rotate about a substantially horizontal axis, substantially perpendicular to the plane of the side mounting bracket 2.

Biasing means 13 may be provided, preferably in the form of a tension adjustable spring (figures 1, 4 and 5) or piston (figures 6 and 7), and may contribute to or augment the biasing force components acting on the adjustable connection points and subsequently the backing plate due to gravity, thereby assisting the backing plate to move toward the raised storage position 5. This may be preferable where an object (such as an outboard motor) is attached to the backing plate, particularly where the usual lifting force resulting from the biasing forces about the adjustable connection points due to gravity are insufficient to locate the backing plate (with the object attached) to substantially the storage position. Where a particularly heavy object, for example a boat outboard motor is attached to the backing plate, the biasing means may preferably

be adjusted to increase its tension and thereby the augmenting lifting face applied to the backing plate to enable tilting.

One end 14 of the biasing means 13 is attached to the backing plate 3 and the remaining end 15 is attached to a fixed point 16, for example transom of a boat or a side mounting bracket 2. It is advantageous that the biasing means 13 promotes increased opposing biasing forces about the adjustable connection points. It may also be desirable that the location of fixed point 16 is able to be adjusted (see for example fixing points 17), and this position adjustment in itself can be used to alter the tension characteristics of the biasing means 13. The biasing means 13 may be connected at any point on the backing plate 3 so long as it assists in increasing the biasing forces about the connection points 6a, 6b and thereby enhances the tilting ability of the tilting device 1.

The side mounting bracket 2 may also include a stopper 18 to prevent backing plate 3from moving to positions beyond than its lowest operating position 4. The stopper may be a simple L-shaped plate or similar device, and provides a resistance to the backing plate moving beyond position 4. Consequently the location of the stopper 18 may substantially determine the lower operating position of the backing plate.

The tilt device 1 may also include a form of locking means 19, which may be employed to substantially stabilise or immobilised the backing plate 3 in a specified tilted position. Such a locking means may be a cable, solenoid, ratchet or latch operated system.

The adjustable connection arrangement and adjustable connection points 6a, 6b are provided by the first pivoting link arm 11 pivotally connected at its upper first end 11a to an upper region 11b of the side mounting bracket 2, and its lower second end 11c is pivotally connected to an upper region 11d of the backing plate 3. The second pivoting link 12 is pivotally connected at is upper first end 12a to an upper region 12b of the side mounting bracket 2, and its lower second end 12c is pivotally connected to a lower region 12d of the backing plate.

The pivoting link arms 11 and 12 may be of substantially different lengths, as in the examples illustrated in figures 1 and 3 although it is also conceived that the arms may be of substantially similar lengths also; with the location of the first upper ends 11a and 12a being suitably located to connect to regions 11d and 12d. In addition, the pivoting link arm arrangement as illustrated may be arranged depending upon the weight of an object, such as a boat outward motor, to be attached to the backing plate and/or in order to achieve a compact design configuration.

The above described invention may be particularly suitable for use with a boat and may be preferably attached to transom region of the boat. The invention could also be included within the boat attachment components of an outboard motor. Tilting device movement is created by means of a free moving engine mounting bracket 2 connected to backing plate 3 by means of pivoting link arms 4 and 5, first pivot point 6a and second pivot point 6b utilising the engine weight pulling downward on mounting bracket 2 moving pivot points 6a and 6b down and outwards in arcs 7 and 8 as indicated by arrows in Figure 3. Further, as illustrated in figures 3 to 7, the pivot link arms may be substituted for a slotted roller-type system 20. This causes the backing plate 3 to rotate causing the engine attached to backing plate 3 to tilt upward and forwards. This upward and forward tilt is illustrated by the lines of the mounting bracket at different tilt positions as indicated by 4 and 5 in figure 2.

As motor size increases (i.e. as motor rated power increases), weight also generally increases, and consequently the tilt mechanism may need some extra pulling force to help tilt the motor. This can be in the form of an adjustable biasing means. The biasing means tension may assist the device to advance toward the raised storage position. Tension adjustment is achievable by altering the anchor position of the spring, or using a different spring or piston (gas, strut or similar). The tension may be adjusted to enable the motor and backing plate to raise to a tilted angle/position adequate to prevent a motor propeller hitting the seabed or ground if boat were in shallow waters. Preferably the tilt device with motor attached is at a raised storage level to allow the

propeller to remain slightly submerged and thereby maintain ability to provide propeller induced thrust to the boat.

The entire tilt device 1 and individual components making up the present invention may be extended in length and/or one or more tilt mechanisms combined to provide for example, two tilt devices, and it is therefore possible to raise two outboard motors at the same time. The components required can be reduced or increased in size and strength to suit different object applications.

As illustrated in figures 8a and 8b the tilt mechanism can be attached to the transom of a boat in either a semi-detached configuration figure 8a, or as more of an integrated structure figure 8b. In figure 8a, the backing plate is attached by fixing means such as screws although any suitable attachment mechanism may be used, e.g. adhesive.

It can be seen that the tilt device utilises the weight of the object fitted to the backing plate to assist the tilting movement. Preferably, the components of the tilt device can be manufactured in rigid material such as aluminium or stainless steel, which are ideally suited for strength and marine corrosion resistance or similar strength materials (such as some plastics materials) can be used with necessary corrosion resistance. Of course, materials for construction are based on their strength requirement and ability to suit the surrounding environmental conditions.

The backing plate3 may be any shape or configuration as required or desired to allow suitable attachment of an object to it. It may be that custom design of a backing plate is required to suitably fit a particular object attachment. The backing plate of the tilt mechanism may be substantially rigid and any such suitable attachment means for connecting the tilt device (ie via the side mounting bracket or otherwise) may be used, for example nails, screws, welding, glue, clamps, etc.

Advantageously, in use, when an object sits on the backing plate the arrangement of pivot points causes rotation of the backing plate, which in turn raises the object without requiring assistance by an operator. The tilt device may be operated from a remote

position (e.g. forward steering position in a boat) by releasing the locking system which may have been activated. In the case of a boat, the locking system may be fully operable from any position in the boat, where a release/lock cable locking system or other can be fitted.

Further, to return the motor to a lower operating position, the repositioning of the motor may be performed manually with very little effort or it can be brought back to the operating position 4 simply by putting the motor into forward gear with the propeller at least partially submerged. By putting the motor into forward gear, the propeller creates thrust in the water, which overcomes the pivoted (spring assisted) balanced tilt position, and the motor and tilt device is forced downwards. This is useful as the motor can drive itself back into the operating position substantially automatically, and the motor can then be locked into a fixed position by utilising the locking system. All of this may be accomplished with minimal user intervention.

Similarly, when forward thrust created by a boat motor propeller is reduced, the motor may rise to a tilted storage position of its own accord. The level of tilt is preferably such that the propeller will still remain submerged enough to allow some reverse propeller thrust drive. However, when utilising the motor in stronger reverse drive, the propeller will create thrust that will tend to want to push the propeller upwards out of the water. This problem may be overcome by either locking the tilt mechanism into a fixed position, or providing a maximum upward tilt position stop (enough to allow upward tilt to avoid propeller grounding, but also to ensure the propeller remains submerged in water to provide reverse drive thrust).

The tilt device according to the present invention provides an advantageous pivoting mechanism to which an object may be attached, and even more preferably provides a pivoted connection arrangement that induces biasing forces about the connection points to induce tilting. The tilting may be increased by the use of an additional biasing means, thereby assisting a tilt device user by reducing the effort required to tilt an object from a lower operating position to a raised storage position. The adjustable connection

arrangement preferably allows the backing plate rotational ability about a substantially horizontal axis.

Aspects of the present invention have been described by way of example only and it should be appreciated that modifications and additions may be made thereto without departing from the scope thereof.